ANNUAL

REPORT FOR 1921

on the

WHITE PINE BLISTER RUST WORK

in the

FAR WEST.

* * * *

Dated at Berkeley, California,
December 2, 1921.

GENERAL

During the year of 1921, blister rust work in the Far West has been carried on along the following lines:

1. Quarantine inspection work, to enforce federal quarantine No. 26.
2. A survey of the two tiers of states immediately west of the federal quarantine line, to determine the advisability of moving the quarantine line.
3. General scouting for blister rust.
4. Special studies of Cronartium occidentale, to determine if this rust is capable of infecting five-leaf pines.
5. Special scouting and inspections in several regions in which a Cronartium occurred on Ribes for which no aecial host had been found.
6. Collection of data on the distribution, taxonomy and ecology of blister rust hosts.

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The quarantine inspection work, under the direction of Mr. C. R. Stillinger, will be reported upon by him. The survey of the two tiers of states immediately west of the quarantine line has been carried on by Mr. G. A. Root, Mr. A. C. Garrett, and Mr. L. N. Goodding, who have given the results of their work to the Washington office. For these reasons, this report will cover only the work on the four latter points enumerated above.

General scouting for blister rust, and the collection of data on blister rust hosts has been carried on during 1921 in eight of the far western states, namely California, Nevada, Texas, New Mexico, Arizona, Utah, Idaho and Montana..The special studies of Cronartium occidentale have been made in California and Nevada. The special scouting in regions where a Cronartium occurred on Ribes for which no aecial host had been found was done in California, Idaho and Wyoming.

Collection of Data on Blister Rust Hosts.

Collection of Field Data. A necessary part of blister rust work in the Far West is the collection and compilation of data on the taxonomy, distribution and ecology of the native Ribes and five-leaf pines. Since the inception of blister rust work in the Far West, the field men have been expected to collect such information in the course of their work, and by this means, coupled with a study of the material in local herbaria, a con-

siderable amount of valuable information has been gained. It was noted, however, that the value of these field notes were greatly lessened because no two men sent in exactly the same data. One man might have good notes on the soil conditions necessary for growth of a certain Ribes species, while another man would give information only on the shade conditions. To obviate such a difficulty, the field men were supplied with definite forms on which to describe the scouting done, and the site conditions of specimens taken. The use of these forms during the season of 1921 greatly facilitated the collection of consistent field notes.

Ribes Herbarium. An herbarium of specimens of western Ribes is gradually being built up at the Berkeley office. Such a collection is valuable for reference in determining specimens sent in from the field, and in acquainting the field men with the Ribes of any locality in which they have not worked before. At the present time, there are a total of 155 sheets in this Ribes herbarium, with 43 western Ribes species represented. In addition to the above, 76 sheets, representing 39 species have been sent to the Washington office, to form the nucleus of a western Ribes herbarium there.

Ribes Garden. During the past year an effort has been made to build up a Ribes garden at Berkeley, California, containing living plants of all western species of Ribes. The purposes for

which this Ribes garden was intended, were as follows:

1. To have conveniently at hand a supply of Ribes plants which could be sent to Washington if they were needed there for inoculation work.
2. To familiarize the western field men with any species of Ribes which they had not seen before.

The Botany Department of the University of California has kindly permitted the use of a plot of land, approximately one acre in extent, in their experimental garden. Approximately 600 Ribes plants have been set out, representing 29 species of western Ribes.

This Ribes garden has not proved entirely successful. The Ribes species which naturally occur on the seaward slopes of the Pacific Coast have grown very well. But the plants which were brought from more arid regions or from high altitudes have either died or have made practically no growth during this year. It is hoped that in the future a better location can be found for this Ribes garden, possibly at some point in the Sierra Nevada Mountains of California.

The general scouting work and the special work on Cronartium will be discussed under the headings of the various states in which the work was done.

Recommendations for Future Work.

The recent discovery of blister rust in southwestern British Columbia and northwestern Washington will to a considerable extent change the nature of future blister rust work in the Far West. For this reason, no definite recommendations are included in this report.

After the extent of the blister rust infection in Washington has been worked out, and a definite program of work for that region has been decided upon, it will be possible to determine how much scouting can be done in other parts of the Far West.

July 1, 1917

A.HOEN & CO. BALTO.

Areas Scouted in California, 1921.

CALIFORNIA AND NEVADA.

The work in California and Nevada for the year of 1921 was carried on by Mr. S. N. Wyckoff, Mr. H.N. Putnam and Mr. C.H.Johnson. This work consisted of (1) general scouting for blister rust, (2) special studies of areas in which Cronartium occidentale was closely associated with five-leaf pines, (3) special scouting around Monrovia and Mineral, (4) collection of data on the distribution of Ribes and five-leaf pines.

General scouting. During August, 1921, general scouting for blister rust was carried on in the Sierra and Sequoia National Forests, by Mr. Wyckoff. These forests are situated on the west slope of the Sierra Nevada Mountains, from 40 to 90 miles south of Yosemite Valley. The areas around Huntington Lake, Fresno County, and from General Grant National Park, Fresno County, to Sequoia National Park, Tulare County, were scouted. No evidence of blister rust was found on either pines or Ribes.

In these regions, which are typical of the southern part of the Sierra Nevada Mountains, the sugar pine, Pinus lambertiana, attains its maximum development. At elevations from 4500 feet to 8000 feet this species is very abundant. Mature trees are numerous, and the reproduction is vigorous. Ribes nevadense, R. cereum, R. viscosissimum, and Grossularia Roezli grow in great profusion, and in close association with the sugar pines. R. cereum is particularly abundant at an altitude of 7000 feet and on granitic soil, these conditions evidently constituting an optimum for this species.

These plants grow in clumps twenty feet in diameter and seven feet high; in many places as many as ten of these clumps per area were noted. Immediately above the sugar pine belt, and at altitudes of 8000 to 9600 feet, P. monticola is abundant. Closely associated with this species are R. montigenum, R. viscosissimum, and G. Roezli.

The extensive development and close association of five-leaf pines and Ribes in this general region make it one in which blister rust would be extremely difficult to control. In general, it may be said that the southern half of the Sierra Nevada Range shows a greater development and closer association of blister rust hosts than the northern half.

During the early spring of 1921 short scouting trips were made by Mr. Wyckoff into the Coast Range Mountains of Napa County, the Coast Range Mountains of Santa Clara County, and the Santa Lucia Mountains of Monterey County. The purpose of these trips was to search for blister rust in areas which had not been previsouly scouted, and to make observations on the Ribes of these regions. No blister rust was found during these trips.

In October, 1921, word was received at the Berkeley office from the California Department of Agriculture that blister rust had been reported in the vicinity of Castle Hot Springs, Lake County. This region was immediately scouted by Mr. Wyckoff. Sugar pines are quite abundant in the mountains of this locality,

at altitudes of 3000 feet and higher. Native Ribes, principally Grossularia californica are uncommon, occurring only on the dryer brushy slopes. A few cultivated Ribes, principally gooseberries, have been grown. Careful scouting on the native sugar pines and Ribes and on the cultivated Ribes failed to show the presence of blister rust.

Special Studies of Cronartium occidentale. During the summer of 1920, a number of overlapping plots were mapped, in which Cronartium occidentale on both pinyons and Ribes occurred in close association with native five-leaf pines. The purpose of mapping these plots was to establish definite locations in which inspections could be made over a period of several years to determine if Cronartium occidentale is capable of attacking five-leaf pines. These plots were located in Mono and Alpine Counties, California, and Douglas and Mineral Counties, Nevada. During the season of 1921, several of these plots were re-mapped, by Mr. Putnam and Mr. Johnson, on a more definite basis, several new plots were mapped, and all of the five-leaf pines on the plots mapped in 1920 were inspected. No evidence of any peridermium was found on these five-leaf pines.

The following table gives in brief the conditions occurring on the five-plots which were mapped this year. In mapping these plots, contour lines were run, in order that the slope, and the exact linear distance between the various pines and Ribes could be figured. A detailed report on these plots will be prepared in the near future.

Overlapping Plots Mapped in 1921.

Plot No.	Location	Size	Five-leaf pines.					Pinyons								Ribes			
			No	Species.	Diameter at ground	Height	Age	No.	Diameter at ground	Height	Age	Peridermia No.	Peridermia No trees infected	Peridermia No per tree	Peridermia Age	No.	Species	No. infected	% of infection.
1	Sweetwater Canyon Sweetwater Mountains California.	4 acres	4	Pinus flexilis	¼ in. to 15 in.	1 ft. to 60 ft.	22 to 200 yrs.	223	¼ in. to 30 in.	9 in. to 45 ft.	6 to 150 yrs.	41	17	1-7	5 to 16 yrs.	113	divaricata 2 cereum 1 velutina 110	102	1 leaf to 90%
2	Sheep Creek Sweetwater Mountains Nevada.	4 acres	11	do	2 in. to 30 in.	5 ft. to 50 ft.	19 to 200 yrs.	45	¾ in. to 18 in.	9 in. to 18 ft.	14 to 100 yrs.	11	4	1-6	7 to 18 yrs.	71	velutina 66 cereum 1 divaricata 4	52	.1% to 70%
3	Sheep Creek Sweetwater Mountains Nevada.	4 acres	31	do	1/8 in. to 18 in.	.6 in. to 40 ft.	2 to 200 yrs.	16	2 in. to 16 in.	2 ft. to 9 ft.	14 to 75 yrs.	4	4	1	?	37	velutina 37	29	1% to 9%
4	West Walker River Mono County California	.95 acres	1	Pinus monticola	14 in.	40 ft.	100 yrs.	45	1/5 in to 14 in.	9 in. to 20 ft.	6 to 100 yrs.	8	5	1-4	? to 11 yrs	28	velutina 22 cereum 6	16	.1% to 100%
5	East Branch Carson River Alpine County California	1 acre.	3	Pinus lambertiana	2½ in. to 4 ft.	6 ft. to 100 ft	32 to 200 yrs.	20	1 in. to 5 in.	1 ft. to 10 ft.	18 to 40 yrs.	1	1	1	11 yrs.	1	velutina 1	1	0 (90% defoliated)

As a part of this investigation, a number of trees, both five-leaf pines and pinyons, were inoculated with local telial material, of Cronartium occidentale. The trees inoculated were located on the plots mapped. The two following methods of inoculation were used:

1. Needle inoculation - Ribes leaves bearing telia were tied among the needles of the terminal growth of the pine. The needles and the Ribes leaves were protected by wet cotton for several days.
2. Bark inoculation - an incision was made in the smooth bark of young, vigorously growing pine wood. Well germinated telia from the local Ribes were inserted into the cut.

The following list gives the number of inoculations, and the host species on which they were made

P. monophylla	7	trees -	1	inoculation per tree.
P. flexilis	1	tree	7	do
do	1	do	5	do
do	1	do	2	do
P. monticola	1	do	3	do
P. lambertiana	1	do	3	do
do	1	do	4	do

Total - 13 trees inoculated, 31 inoculations made.

For the purpose of determining the factors governing the infection of Ribes by Cronartium occidentale, several strip sur-

veys were made in this region. The results of this work are embodied in a special report accompanying this more general discussion.

In connection with the plotting work, general scouting was carried on by Mr. Putnam and Mr. Johnson in the region from Truckee, California to Bridgeport, California. The following summary gives the points at which scouting was done, and the number of blister rust hosts inspected.

General Scouting, 1921,
Truckee, California, to Bridgeport, California.

Locality	Linear miles of scouting	Five-leaf pines inspected.	Ribes inspected.
Truckee, California	16	--	178
Virginia City, Nev.	12	--	114
Carter's Station, 11 miles south of Minden, Nevada.	1	--	49
Markleeville, Calif. (H.N.Putnam)	200	195	1080
Markleeville, Calif. (C.H.Johnson)	260	111	952
Sweetwater Mts. Calif. and Nevada	365	1150	1722
West Walker River, 12 miles north of Coleville, Calif.	80	15	359
Coleville, Calif.	56	107	203
Bridgeport, Calif.		122	774
Total	990	1700	5431

The five-leaf pines inspected consisted of P. lambertiana, P. monticola, P. flexilis, and P. albicaulis. The following species of Ribes were found in these regions; Ribes cereum, R. aureum, R. nevadense, R. montigenum, Grossularia Roezli, G. divaricata, G. velutina, G. lasiantha. No evidence of blister rust was found in these localities.

In the course of this scouting, Cronartium occidentale was found on two new host species. Two leaves of R. montigenum were found infected at Sheep Creek, Nevada. G. lasiantha was found infected at Sheep Creek, Nevada, also.

Special Scouting near Monrovia. In January, 1921, scouting was carried on in southern California by Mr. Wyckoff and Mr. Johnson. The purpose of this scouting was to ascertain the actual distance between the infected Ribes and the nearest native five-leaf pines. A number of mature trees of P. lambertiana on the summit of Mt. Wilson were found to be approximately 5 miles in an air line from the nearest infected Ribes, which occurred in Eaton Wash, at the south base of Mt. Wilson. These pines were carefully inspected, but no evidence of any peridermium was found. Large numbers of both young and old sugar pines, representing 25% of the total coniferous stand, were found in San Antonio Canyon, 20 miles southeast of Monrovia. Numerous inspections in this locality also failed to reveal the presence of a peridermium on these pines. The Ribes, Ribes nevadense,

R. cereum, and Grossularia Roezli, were all defoliated at this season.

During October, 1921, all planted five-leaf pines in the general region of Monrovia were inspected again. The pines in the area represented by Los Angeles, Hollywood, Pasadena, Los Nietos, Duarte, Sierra Madre, Alhambra, and Monrovia were inspected. No evidence of a peridermium was found on these trees.

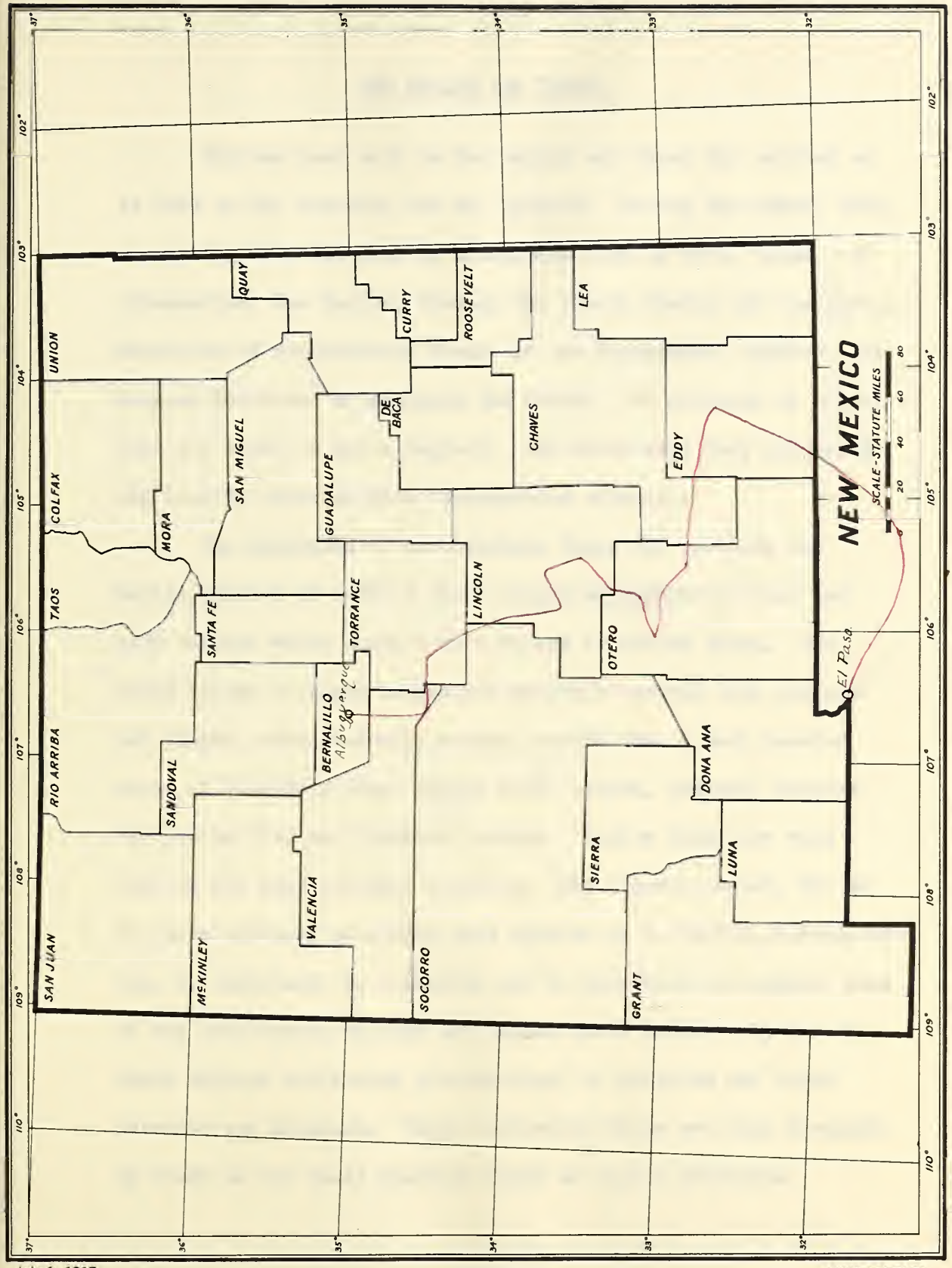
Special Scouting near Mineral. During the season of 1919, an infection of Cronartium was found on Ribes at Mineral, Tehama County, California. Mineral is located in the main sugar pine belt on the west slopes of the northern Sierra Nevada Mountains, and is approximately 70 miles from the nearest known pinyons. It was considered possible that the infection on Ribes at this point consisted of Cronartium ribicola, rather than Cronartium occidentale. Scouting in 1919 failed to reveal the presence of a peridermium on five-leaf pines in this vicinity. In 1920 this region was again scouted, numerous Ribes and five-leaf pines being inspected. No infection was found on either Ribes or five-leaf pines.

During the season of 1921, further scouting was done in the vicinity of Mineral by Mr. Putnam. The following table gives the points at which the scouting was done, and the number of Ribes and five-leaf pines inspected.

Special Scouting, 1921,
in Vicinity of Mineral, California.

Locality	Distance from Mineral	Linear miles of scouting	Five-leaf pines inspected	Ribes inspected
Mineral	0	18	350	235
Chester	22	22	300	278
Westwood	32	12	40	72
Susanville	30	20	--	42
Total		72	690	627

No evidence of Cronartium on Ribes or peridermium on five-leaf pines was found in the course of this scouting.



Areas Scouted in New Mexico, and Texas, 1921.

NEW MEXICO and TEXAS.

Blister rust work in New Mexico and Texas was carried on in 1921 by Mr. Goodding and Mr. Wyckoff. During September, 1921, a scouting trip was made by automobile from El Paso, Texas, to Albuquerque, New Mexico, through the Sierra Diablo and Guadaloupe Mountains of northwestern Texas and the Sacramento, Capitan, and Manzano Mountains of southern New Mexico. No evidence of blister rust was found in these regions. The Ribes were very generally and heavily infected with Coleosporium ribicola.

The mountains of northwestern Texas and southern New Mexico consist of several short ranges separated by broad and arid valleys which contain no conifers or native Ribes. The lower slopes of these ranges are sparsely covered with juniper and pinyon, this gradually merging upward into a much heavier stand of five-leaf pine, yellow pine, pinyon, juniper, Douglas fir, white fir, and Engelmann spruce. Native Ribes are very rare in the more southern ranges of this general region, but in the more northern mountains such species as R. Wolfii, R.mescalerium, R. inebrians, G. leptantha and G. pinetorum are common. Some of the intervening valleys are farmed quite intensively and in these valleys cultivated gooseberries, R. odoratum and black currants are abundant. These cultivated Ribes are also frequently found in the small mountain farms at higher altitudes.

Summer rainfall is frequent and heavy in all of these mountain ranges. This favorable moisture condition, coupled with the abundance and close association of blister rust hosts would undoubtedly allow the blister rust to flourish in these mountains. But it is extremely doubtful if this disease would be capable of natural dissemination across the wide, dry, hot intervening valleys which are not intensively cultivated. It could doubtless easily cross those valleys in which cultivated Ribes are generally planted.

If blister rust ever reached this region it would flourish in restricted mountainous localities, but could probably be stopped in its spread from one mountain range to another, and thence to the main five-leaf pine belts of the Rocky Mountain and Pacific Coast.

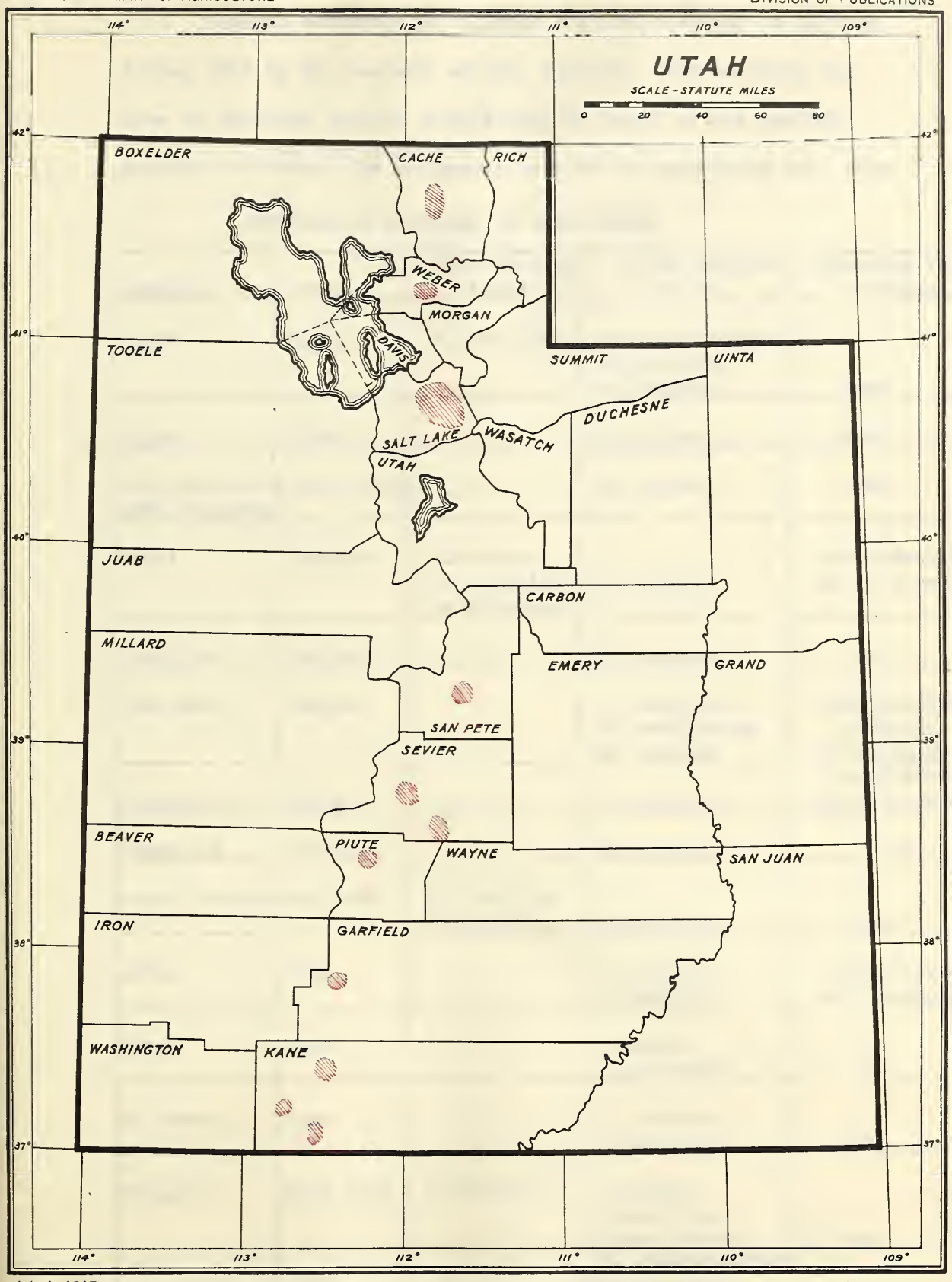
Emphasis should be laid on the value of an automobile for scouting in this region. The country is very sparsely inhabited, and much of it is inaccessible by either railroad or stage. The prevailing rate for auto hire is 25¢ per mile. By the use of Mr. Goodding's personally owned machine, the two men engaged in this work were able to scout regions some of which were 100 miles from any town, and at a total transportation cost of 7¢ per mile. The use of a government machine or a personally owned machine will materially decrease scouting costs and greatly in-

crease the efficiency of the work, in the southwestern states.

The following tabulation briefly summarizes the findings of this scouting trip.

Summary of Scouting in New Mexico and Texas, 1921.

Mountain Range	Pine species found	Ribes species found	Diseases found on Ribes.
Sierra Diablo Mountains, Texas.	Pinus edulis P. cembroides	None	None
Guadeloupe Mts., Texas.	P. strobiformis P. ponderosa P. edulis P. cembroides	None	None
Sacramento Mts., New Mexico	P. strobiformis P. flexilis P. ponderosa P. edulis	R. Wolfii R. mescalerium R. aureum G. pinetorum Cultivated black currants, R. odoratum and gooseberries.	Coleosporium ribicola on all native Ribes, and on cultivated gooseberries and R. odoratum.
Capitan Mts., New Mexico.	P. edulis P. flexilis P. strobiformis P. ponderosa	G. pinetorum Cultivated R. odoratum and gooseberries.	Coleosporium ribicola on all Ribes, both native and cultivated.
Manzano Mts., New Mexico.	P. edulis P. flexilis P. ponderosa	G. leptantha R. inebrians R. Wolfii	Coleosporium ribicola on all Ribes, both native and cultivated.



July 1, 1917 A. HOEN & CO. BALTO.

Areas Scouted in Utah, 1921.

UTAH

General scouting for blister rust was carried on in Utah during 1921 by Mr. Garrett and Mr. Wyckoff. The scouting was done in thirteen general localities, in eight of the central counties of Utah. The following tabulation summarizes this work.

Summary of Scouting in Utah, 1921.

Locality	County	Pine species found	Ribes species found	Diseases found on Ribes.
Logan	Cache	P.flexilis	R.viscosissimum R.inebrians G. inermis	None
Ogden	Weber	--	R. aureum	None
Salt Lake City (and vicinity)	Salt Lake	--	R. aureum	None
Manti	Sanpete	P.edulis P. flexilis P. aristata	R. aureum	C.occidentale on R. aureum
Richfield	Sevier	--	R. aureum	do
Fish Lake	Sevier	--	R. inebrians R. montigenum G. inermis	Coleosporium ribicola on inebrians.
Marysvale	Piute	--	R. aureum	C.occidentale on R. aureum
Panguitch	Garfield	--	R. aureum	do
Bryces Canyon	Garfield	P.flexilis P.aristata	R.inebrians	None
Alton	Kane	--	R. aureum R.inebrians	C.occidentale on R.aureum
Kanab	Kane	--	R.aureum R.inebrians	do
Mt.Carmel	Kane	--	R. aureum R.inebrians	do
Brighton	Salt Lake	P.flexilis	R.Wolfii R.inebrians R.montigenum R. viscosissimum G. inermis	None

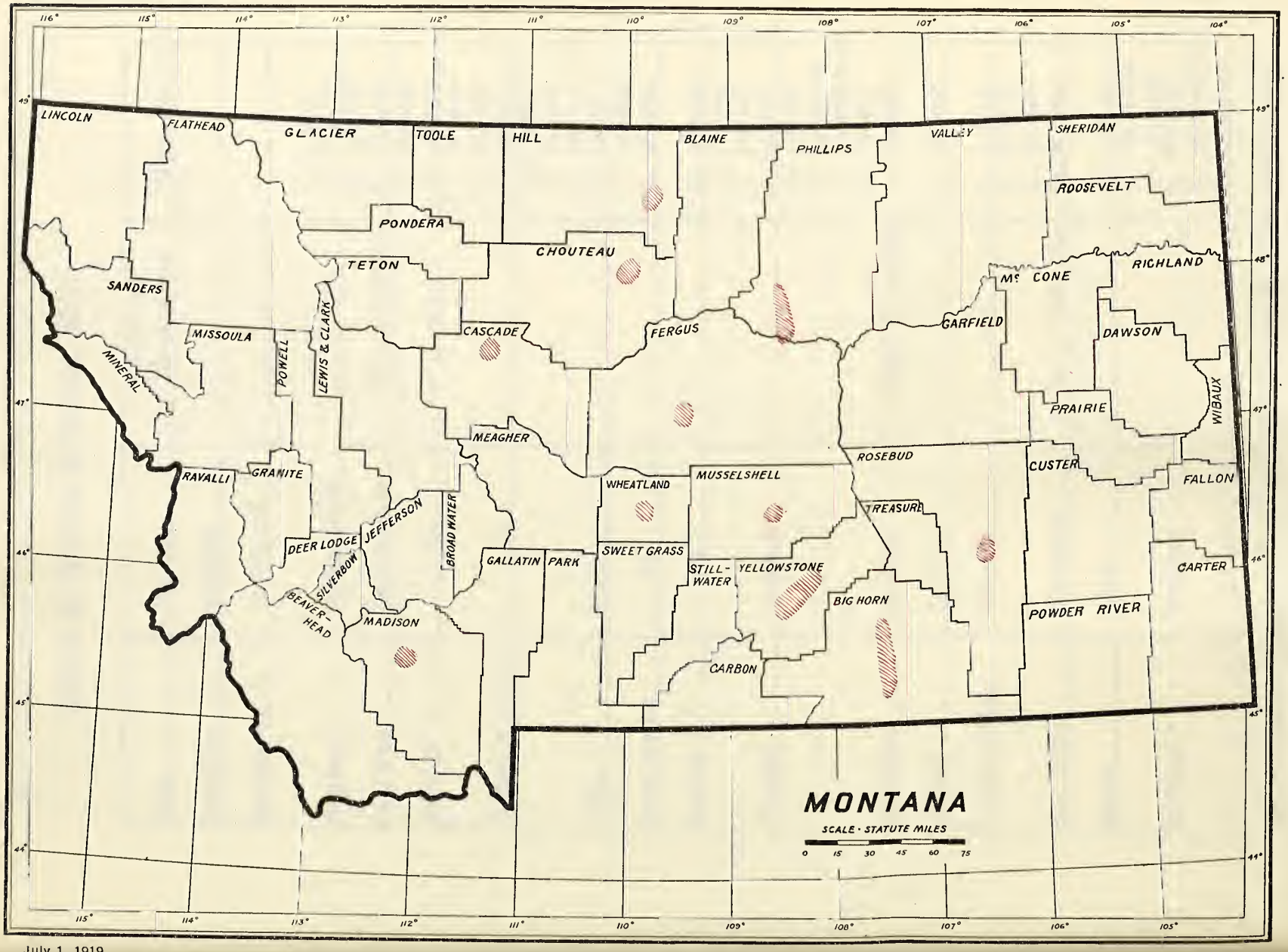
No blister rust was found in any of these localities.

At Manti, Sanpete County, twelve trees of P. aristata were found within ten miles of R. aureum plants infected with Cronartium occidentale. These trees showed on evidence of attack by this rust. This was the only point in Utah at which C. occidentale was found in the same locality with five-leaf pines. If intensive scouting were done in this region during another season, it is probable that a plot could be mapped showing a close association of P. aristata and Cronartium occidentale.

MONTANA.

Blister rust work in Montana during the season of 1921 was carried on by Mr. Root. Following the completion of the survey of the Montana-North Dakota border, Mr. Root scouted through sixteen communities in eleven of the central counties of Montana. In addition to scouting for blister rust, Mr. Root compiled considerable valuable data on the distribution of the blister rust hosts of central Montana.

The following table summarizes the work of Mr. Root in Montana.


LINCOLN
FLATHEAD
GLACIER
TOOLE
HILL
BLAINE
PHILLIPS
VALLEY
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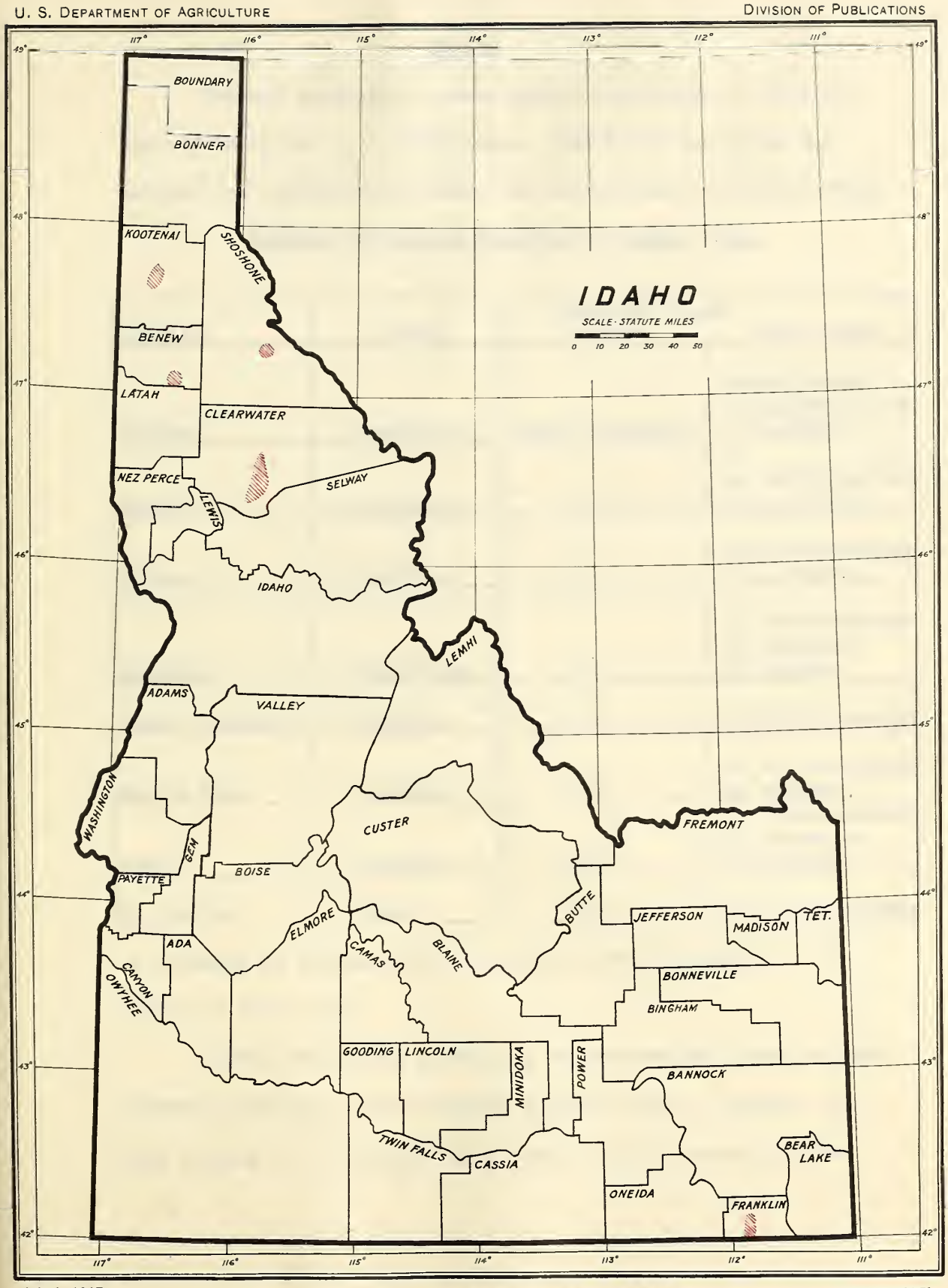
ROOSEVELT
PONDERA
TETON
CHOUTEAU
RICHLAND
SANDERS
Mc CONE
MISSOULA
POWELL
LEWIS & CLARK
CASCADE
FERGUS
GARFIELD
DAWSON
MINERAL
WIBAUX
PRAIRIE
MEAGHER
ROSEBUD
CUSTER
RAVALLI
GRANITE
WHEATLAND
MUSSELSHELL
FALLON
TREASURE
JEFFERSON
BROAD WATER
DEER LODGE
SILVERBOW
GALLATIN
PARK
SWEET GRASS
STILL-WATER
YELLOWSTONE
CARTER
BEAVER-HEAD
MADISON
BIG HORN
POWDER RIVER
CARBON
MONTANA
SCALE · STATUTE MILES
0 15 30 45 60 75

Summary of Scouting in Montana, 1921.

Town	County	Five-leaf pines found	Ribes found.
Sheridan	Madison		
Harlowtown	Wheatland		
Roundup	Musselshell		R. cereum R. aureum.
Billings	Yellowstone	Pinus flexilis	R. cereum R. aureum
Huntley	do	do	R. cereum R. aureum
Pompey's Filler	do		R. cereum R. aureum G. setosa.
Wyola	Bighorn		R. cereum R. aureum R. americanum G. setosa
Crow Agency	do		R. aureum G. setosa
Hardin	do		R. aureum
Forsyth	Rosebud		R. aureum R. cereum G. setosa
Lewistown	Fergus	Pinus flexilis	R. cereum R. lacustre R. americanum G. setosa R. aureum
Wilder	Fergus		R. aureum
Great Falls,	Cascade		R. aureum
Big Sandy	Chouteau	Pinus flexilis	R. cereum R. aureum G. setosa
Havre	Hill		R. aureum
Zortman	Philips		R. lacustre R. cereum R. aureum R. americanum G. setosa

No evidence of blister rust on either pines or Ribes were found in the course of this work.



July 1, 1917

A. HOEN & CO. BALTO.

Areas Scouted in Idaho, 1921.

IDAHO.

General scouting in Idaho during the season of 1921 was carried on by Mr. C. R. Stillinger. The following table summarizes the localities scouted, and the blister rust hosts found.

Summary of General Scouting in Idaho, 1921.

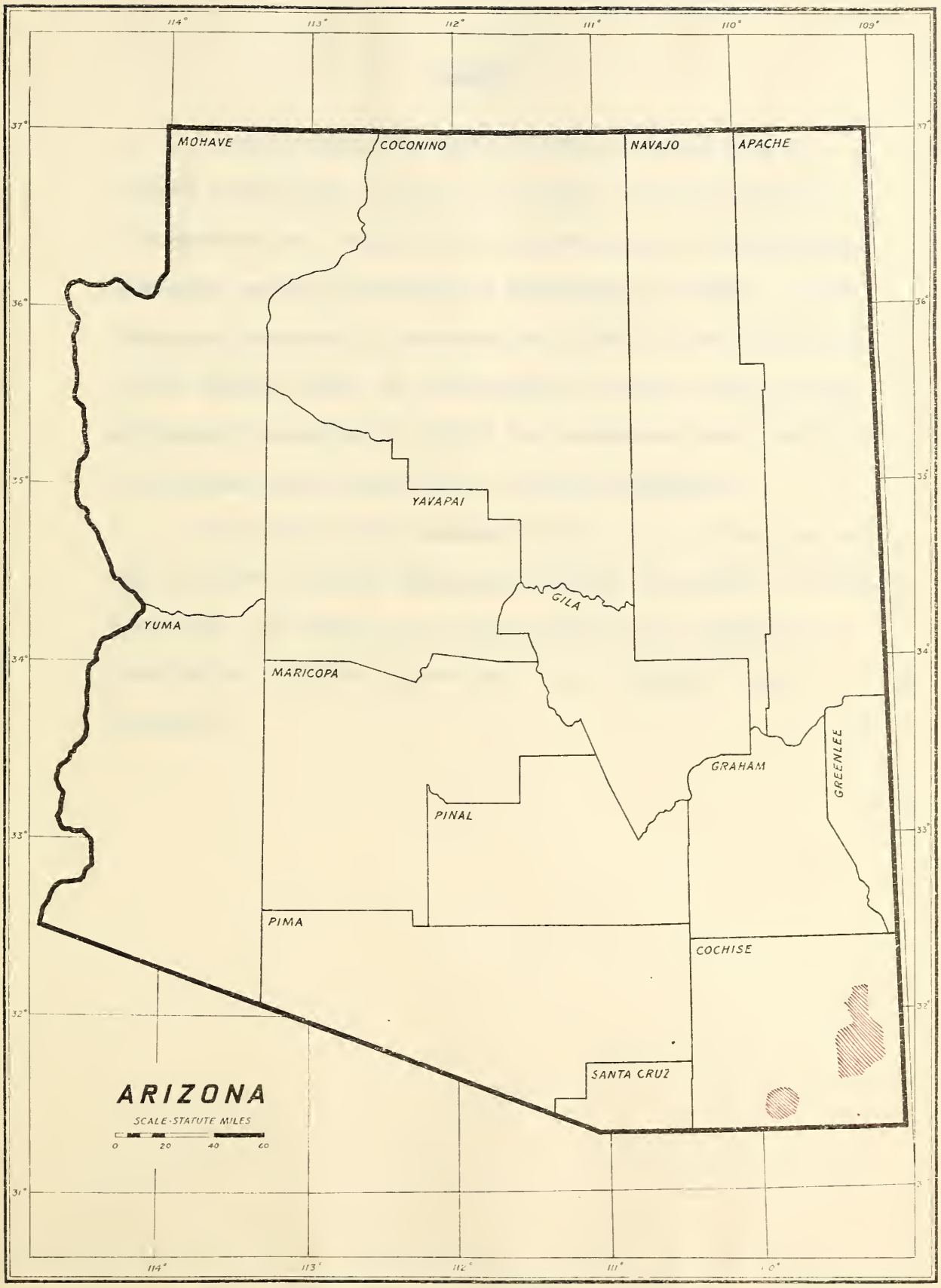
Locality	County	Five-leaf pines found	Ribes found.
Pierce	Clearwater.	Pinus monticola	R.petiolare R. viscosissimum G. cognata
Oxford	Clearwater	do	R. viscosissimum R. petiolare
Weippe	Clearwater	do	R. viscosissimum G. irrigua
Bungalow	Clearwater	do	R. viscosissimum R. lacustre G. cognata
Coeur d'Alene	Kootenai	do	R. viscosissimum
Hayden Lake	Kootenai	do	R. viscosissimum G. cognata
Avery	Shoshone	do	R. viscosissimum R. lacustre G. cognata
St. Maries	Benew	do	R. viscosissimum

No evidence of blister rust was found by Mr. Stillinger in the course of this work.

During the season of 1920, a Cronartium was found on Ribes aureum at Preston, in the extreme southern part of Idaho. As both pinyons and five-leaf pines occur in this general region,

it was thought advisable to find the aecial host for this rust, in order to prove its identity. Further scouting was done in this locality in 1921, during the latter part of August, by Mr. Garrett. At this time the Cronartium could not be found.

If it is considered advisable to scout further for the aecial host of this rust, the work should be done earlier in the season. In the case of Cronartium occidentale, there is a considerable mid-summer period in which this rust, as it occurs in the Rocky Mountains, is extremely difficult to find on either its telial or aecial hosts. The cankers on the pinyons sporulate quite early in the season, while the rust on Ribes does not appear until late summer or early fall. Since the rust is now known to occur on Ribes in the vicinity of Preston, any future scouting should be done in early summer, in order to find the aecial host.



July 1, 1919.

Areas Scouted in Arizona, 1921.

ARIZONA

A small amount of general scouting work was done in Arizona during 1921 by Mr. L. N. Goodding. In the early part of September, Mr. Goodding spent several days in the Chiricahua Mountains, and Mule Mountains of southeastern Arizona. In the Chiricahua Mountains G. pinetorum was found to occur very sparsely, in limited areas. P. strobiformis is quite common at high altitudes, forming 25% to 50% of the coniferous stand. No Ribes or five-leaf pines were found in the Mule Mountains.

In regard to these mountain ranges, Mr. Goodding reports that they are of little importance from the standpoint of blister rust work. The Ribes are so few in number and so limited in distribution that the blister rust would be unable to gain a foothold.

WYOMING.

The report of a Cronartium on Ribes in eastern Wyoming led to some special scouting in this region by Mr. Ellsworth Bethel, Pathologist, of the Office of Forest Pathology, and Mr. Goodding, of this office. The results of this work have been reported by Mr. Bethel and Mr. Goodding, so that a detailed description is not necessary here. The Cronartium was found on Ribes in seven localities in eastern Wyoming, from Acme, near the Montana boundary line south to Cheyenne and Pine Bluffs, in the southeastern part of the state. One point of infection was found at Kimball, Nebraska.

Mr. Bethel has tentatively referred this rust to Cronartium occidentale, but recommends that further work be done there next season.

Berkeley, California.
December 2, 1921.